PROCESSES OF RADICAL AUTO-PURIFICATION OF AQUATIC SYSTEMS

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Several recent studies have detected numerous pharmaceuticals and personal care products (PPCPs) in natural waters throughout the world. The full extent, magnitude and ramifications of their presence in the aquatic environment are largely unknown, but it is evident that their environmental impact will be determined by their fates and lifetimes and biological activity of any degradation products.

One of the main ways of PPCPs degradation is photolysis.

This work is dedicated to the indirect photolysis (hydroxyl radical mediated) of selected PPCPs. Hydroxyl radicals play an important role in natural water environment auto-purification. Radical state of natural waters may be characterized by the inhibiting capacity ($\sum k_i[S_i]$), the parameter that ranges from 10^4 s^{-1} for rather clean waters to 10^6 s^{-1} for strongly polluted waters.

The objective of this research is the study of influence of antibiotics oxytetracycline (OTC) and lincomycin hydrochloride (LM) and their photodegradation products on radical processes in the aquatic systems. The study has been performed with and without addition of the copper (II) ions, which are main catalysts of natural redox processes.

It has been found that $\sum k_i[S_i]$ values are higher in the presence of LM than of OTC and in general ranged from 2.74 to 8.50 $\cdot 10^5$ s^{-1}(at pH 7 and T = 20 C°). In the presence of Cu^{2+} ions the $\sum k_i[S_i]$ values are lower for model-systems with both antibiotics, that could be explained by the formation of the antibiotic-Cu^{2+} complexes, which produce active radicals being photodegradated. Detected $\sum k_i[S_i]$ values for these systems range from 0,42 $\cdot 10^5$ s^{-1} to 1,59 $\cdot 10^5$ s^{-1}.

The analysis of the photolysis products has shown difference between the products formed in the presence of Cu^{2+} and the products formed in systems without addition of Cu^{2+}.

In conclusion, the investigation has shown that studied antibiotics don't have significant influence on the processes of radical processes in aquatic systems. The difference between photodegradation products formed in the presence and without additive of Cu^{2+} emphasizes the importance of identifying and studying photolysis products and intermediates of PPCPs in the presence of different naturally occurring metal ions, which may form complexes with them and thus catalyze the formation of several degradation products with different biological activity.